

DESCRIPTION OF THE IMMATURE STAGES OF
CRYPTOLABIS MAGNISTYLA ALEXANDER

(Diptera: Tipulidae)

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The genus *Cryptolabis* is one of the few crane-fly genera for which no immature stages have previously been found or described. At Salmon Creek, located in Monterey County 1.5 miles north of the San Luis Obispo County line on U.S. Hwy. No. 1, a number of larvae and pupae of this genus were collected and were then reared in the laboratory to the adult stage. Alexander found this fly to be a new species and has published a description of the adult (Alexander, 1962).

Collections were made with a plankton net. The immature forms were kept at cool temperatures until they could be transferred to an "artificial stream" for rearing in the laboratory. The recirculating water in the stream was kept at 16° C, which corresponded favorably with the temperatures in the natural stream.

Cryptolabis magnistyla is univoltine, emerging about the middle of June and reaching a population crest about the first week of July. Some adult specimens may still be found in late July and during the first part of August. They are found in great numbers on the vegetation along the stream.

The eggs are laid at the surface of the stream and, due to the presence of a hard slippery cuticle and to their shape, they sink rapidly in the water and work into the sand and gravel on the bottom. The egg develops in ten days at room temperature, and it is assumed that at the cooler natural stream temperatures (10° to 16° C), the developmental period would be somewhat longer.

The larvae are entirely aquatic and in Salmon Creek are found in sand and gravel beneath one to twenty-four inches of swiftly flowing water. During the rains of the winter season, the depth of rushing water over the same habitats is approximately eight feet. The larvae are very sensitive to changes in temperature of the water and soon die after removal from the natural habitat unless kept at a temperature of less than 17° C. Found associated with the larvae of *Cryptolabis* are members of the crane-fly genera *Hexatoma* and *Limnophila*. Whether the plentiful numbers of *Cryptolabis* larvae serve as food for these probably carnivorous species has not as yet been determined.

The pupae of *Cryptolabis* remain in the larval habitat until just prior to emergence of the adults. They then rise to the surface, and the adults emerge while the pupal case floats at the surface of the water or after it has been washed to the sides of the stream. These field observations coincide with those made on specimens reared in breeding cages in the artificial stream. Emergence under natural conditions and in the artificial stream was always observed to occur at night. Copulation and oviposition behaviors of these flies were observed in the breeding cages, and most of these activities appeared to be confined to the period between dusk and dawn. In the breeding cages pairs were observed to copulate while resting on the surface of the flowing water. Copulation in nature was most often observed on the undersides of leaves.

The following descriptions of the immature stages were drawn from observations made upon ten eggs, twenty-five larvae, and twenty-five pupae.

Egg. Length 0.31 mm; width 0.14 mm. Oval or nearly trapezoid; chorion black, smooth, hard and slippery. The dorsal surface convex, the ventral surface flattened.

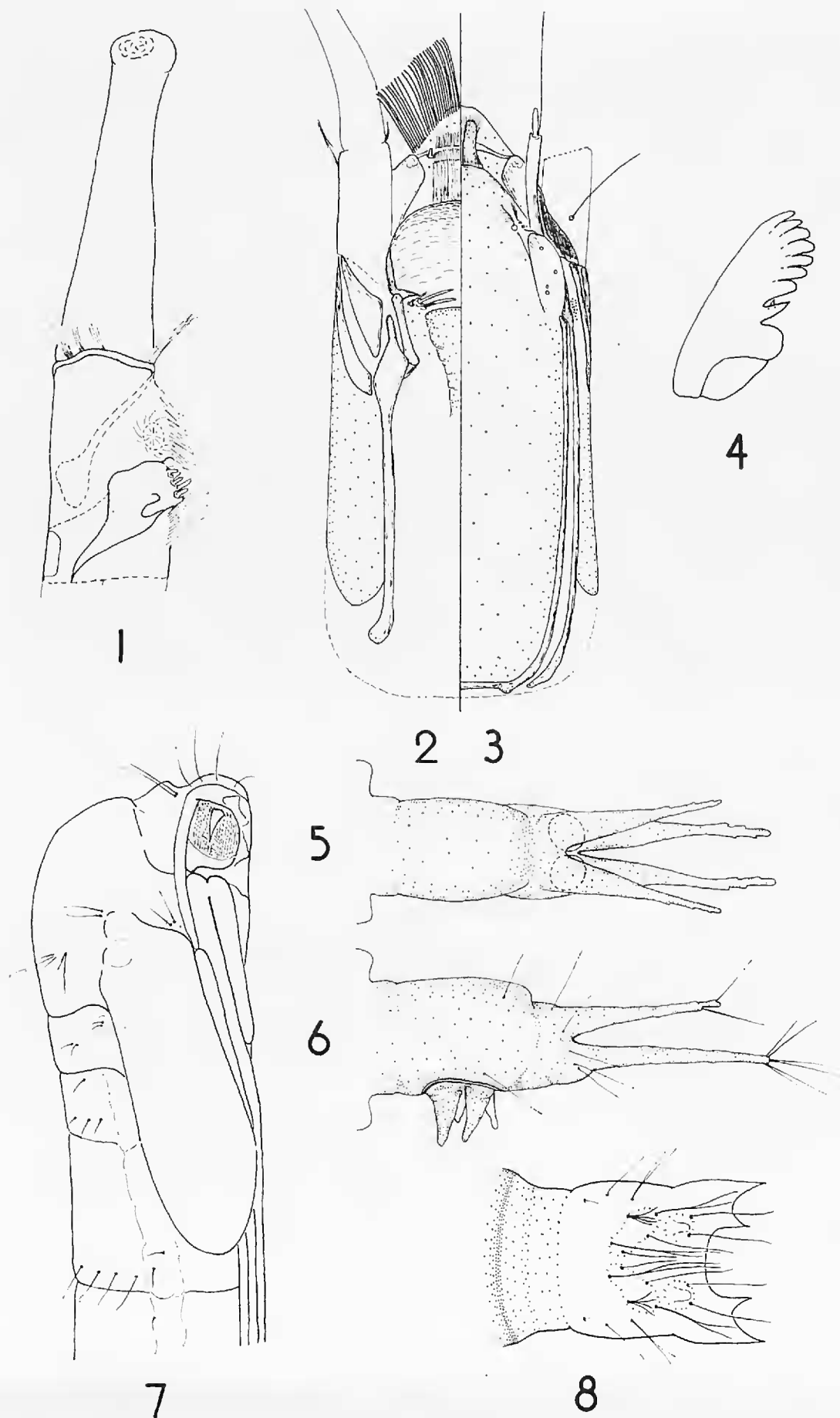
Last instar larva. Length 8.3 to 11.4 mm; width 0.5 to 0.9 mm. Cuticle colorless and covered with very short, pale gold pubescence. On each segment are scattered a few very long setae. The spiracular disk (Figs. 5, 6) has four lobes, with the two dorso-lateral lobes being shorter than the two ventral lobes. All the lobes are variously pitted where the setae originate. The dorsal lobes bear setae only on the upper surface, while the ventral lobes have setae over the entire surface. The spiracles contain no pigment, and their position is indicated on the drawing by broken lines. Ventral to the spiracular disk are four anal lobes, which are clear, fleshy and pointed.

Head capsule: Length 0.345 to 0.391 mm; width 0.136 to 0.187 mm. Typically Eriopterine, consisting of a dorsal and two lateral plates. The dorsal plate is sclerotized heavily along the lateral and posterior margins. The lateral plates are also sclerotized along the margins which continue far caudad of the central membranous portions (Figs. 2, 3).

The labrum is a protruding, fleshy, nearly triangular structure; dorsally, it is clearly separated by a suture from the fronto-clypeal region. The entire antero-ventral margin of the labrum bears a row of thick, blunt, recurved, golden setae forming the labral brush. Articulating with, and extending from, the ventral edge of the lateral plates of the clypeal region are two flattened rods (the tormae) which are borne on the epipharyngeal surface

EXPLANATION OF FIGURES

Cryptolabis magnistyla Alexander. Fig. 1, Maxilla of larva, ventral view. Fig. 2, Larval head capsule, ventral view. Fig. 3, Larval head capsule, dorsal



view. Fig. 4, Larval mandible, lateral view. Fig. 5, Larval spiracular disk, dorsal view. Fig. 6, Larval spiracular disk and anal lobes, lateral view. Fig. 7, Pupa, lateral view. Fig. 8, Male pupal cauda, dorsal view.

of the labrum near the clypeo-labral suture. Dorsally, there are two large cylindrical papillae which arise near the clypeo-labral suture and which appear to belong to the labrum; the anterior third of each of these papillae is heavily setulose. The anterior rim of the fronto-clypeal area is composed of a semicircular central lobe with a triangular sclerite on each side. The palatal surface bears three rows of setae. The first row is about one-half as long as the second and is directed cephalad. The second row lies directly behind the area of the tormae and extends caudad to the mouth opening; a short stout papilla is located at either end of the row. The third row of setae is behind the second, directed caudad and extending to the mouth opening. The antennae are elongate, cylindrical, curved and slightly enlarged at the anterior end. At the tip of each antenna are located one large papilla and three setae, two very short and one nearly as long as the antennae. The mandible (Fig. 4) has eight teeth along its ventral edge, the first (or apical tooth) through the seventh curving slightly mesad. The eighth tooth turns mesad forming a nearly perpendicular angle with the dorso-ventral axis of the tooth. At the base of this tooth is a much smaller tooth which is directed vertically. The maxillae (Fig. 1) are modified in that the palps are greatly enlarged, being longer than the basal stipes. The aboral margin of the stipes where it is fused to the palp is sparsely setulose. Along the mesal edge of the stipes is a long tuft of setae. From this tuft and continuing caudad along the oral surface of the stipes is a thick row of setae, which, in reference to the other mouthparts, is continuous with the labral brush. Nearly midway along the oral surface is found a group of lightly sclerotized tubercles. The aboral or dorsal articulation of the mandible and maxillae with the ocular plate has undergone a curious type of development in this genus. A sclerotized area in the form of a triangular plate extends from the base of the maxillae to a point at its distal end where it articulates with the flattened expansion of the ventral rod. This expansion of the ventral rod may represent a remnant of the maxillary plate. The previously mentioned triangular plate may be a fragment of the ocular lobe, or it may be the cardo. The mandible also articulates with another longer, triangular plate which curves caudally and ventrally to articulate with the remnant of the maxillary plate posterior to the fragment of the ocular lobe (or cardo). It is proposed that this plate be called the mandibular fragment of the ocular lobe. The hypopharynx is membranous, bulbous and possesses a triangular sclerite on each side which articulates with the rod-like vestiges of the submentum. Mesal to this articulation, on each side, is a group of fleshy papillae. The salivary duct opens into the alimentary tract between these vestiges of the submentum. The surface of the hypopharynx is covered with rows of spatulate, toothed, slightly curved setae.

Pupa. Length 5.4 to 6.6 mm; dorso-ventral width at base of wing pads 0.54 to 0.87 mm; dextro-sinistral width at base of wing pads approximately the same as that of the dorso-ventral width. Form terete, with abdominal segment 8 slightly, but abruptly, smaller than segment 7. Integument thin; details of the adult fly easily seen in older pupae. Color in life pale yellow, with thoracic dorsum darker; wing pads, egg sheaths and face darker brown

in older specimens; eyes changing from reddish to dark brown as pupa matures. Body armed with long setae (Fig. 7). A row of six setae is present in a groove between the antennal sheath and median area of the prothorax. The mesothorax lacks breathing horns; the dorso-cephalic margin convex; carinate medially for nearly half its length; not armed with spines or tubercles; two setae located at the junction of the antennal sheaths and wing pads; two setae also occur just dorsad of the base of the wing pads. On the dorsum of the mesonotum two groups of setae occur at a point one-fourth the length of the mesonotum from the posterior margin of the mesothorax, the mesal group composed of four to five setae, the ventral group of two to four setae. The wing pads end anterior to the junction of the second and third abdominal segments. The leg sheaths extend nearly to the caudal margin of the third abdominal segment with the prothoracic and metathoracic sheaths subequal, the mesothoracic sheaths somewhat shorter. The chaetotaxy of abdominal segments 2 to 7 is a single transverse row of setae just cephalad of the posterior margin of the segment. The dorsum of the cauda (Fig. 8) bears four blunt mounds from which weakly sclerotized, finger-like lobes protrude, the anterior pair directed more caudad than the posterior pair, the posterior pair more prominent. The drawing shows from one to four setae arising from specific areas. In actuality, each of these areas from which setae originate may have pencils of from one to four setae, depending upon the condition of the specimen.

Cauda of the male with the ventral lobe bulbous, short, crenulate and bearing a long seta at the base of either side; dorsal lobes furcate with the outer spine longer, the entire lobe directed slightly dorsad. As in the adult stages, the female cauda are very similar to those of the male in external appearance.

Further work should be done on the morphology of the larval forms of members of the tribe Eriopterini before such information can contribute to the study of relationships among these flies. Upon the basis of adult characteristics, Alexander (1956) placed the genus *Cryptolabis* in a subtribe along with *Molophilus*, *Tasio-cera*, *Ormosia* and *Erioptera*. The armature of the pupa and the characteristic long setae of the larval forms, along with the elongate antennae of the larval head capsule, suggest a close relationship with the genus *Rhabdomastix*. The peculiar fragmentation of the lateral extension of the ocular plate is similar to that found in the head capsules of the genera *Teucholabis* and *Gonomyia*, which are otherwise quite different larval forms. The absence of mesonotal breathing horns in the pupa and the elongated lobes of the spiracular disk of the larvae may be important in the placement of the genus within the Eriopterini; however, both of these characteristics are subject to interpretation. The pupae of certain other species which lack breathing horns have as their habitat

swiftly flowing water. Notable among these is *Erioptera claripennis* Alexander of South Africa (Wood, 1952). *E. claripennis*, too, has elongate lobes of the spiracular disk. This latter condition is also found among members of the subgenus *Elaeophila* of the genus *Limnophila*. The members of this subgenus are found quite often in the same type of habitat described above for *Cryptolabis*. The extended lobes aid the larvae of *Cryptolabis* in maintaining their position in streams, with the long setae entwining in the filamentous algae which are adhering to the substrate. Consequently, these characters suggest a close correlation of structure to habitat, and this must be considered when using these characters in the placement of the genus within the Eriopterini.

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A NEW OEDIPODINE GRASSHOPPER FROM CALIFORNIA (Orthoptera: Acrididae)

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Field studies by personnel of the California State Department of Agriculture have resulted in the finding of *Aerochoreutes carlinianus* (Thomas) in California; two males and a female have been studied. These specimens, from Grass Valley in western Nevada County, are referable, on the basis of head structure, to the race *streptitus* Rehn, and the wing venation of one of the males also accords with the pattern of this race. The other male, however, presents a wing venation more like that of *carlinianus* proper. The wings are hyaline with dark veins and veinlets, the radiate veins with dark "pencilling" (Rehn 1921, Trans Amer. Ent. Soc. 47:171-197. The body and tegmina are dun colored, similar in appearance to Great Basin specimens.

These field studies have also led to the accumulation of a series of *Aerochoreutes* from localities in the Coast Range of northern California. While the wing structure of these insects is that of *Aerochoreutes* the sum of their characters makes identification